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Pest Management
Solutions for Specialty
Crops and Minor Uses

October 8, 2013

Ms. Barbara Madden
Minor Use Officer
US EPA OPP/Proc Desk (REGFEE)
Room S-4900
2777 S. Crystal Drive
Arlington, VA 22202

Dear Ms. Madden,

RE. Benefits Discussion for the IR-4 Streptomycin Petition Proposing Tolerances For Streptomycin Use In The Production Of Tomato (Field and Greenhouse) and Grapefruit

On behalf of the IR-4 Project I request that the subject IR-4 streptomycin uses be designated as beneficial for the control of citrus canker (*Xanthomonas citri* subsp. *citri*) in grapefruit and bacterial spot (*Xanthomonas* spp.) in tomato production (field and greenhouse). IR-4 feels it would be beneficial to register the use of streptomycin on both grapefruit and tomato (field and greenhouse).

Streptomycin (the active ingredient in FireWall™17 WP bactericide/fungicide from AgroSource, Inc.) is an antibiotic of the aminoglycoside class and is produced by the bacterium *Streptomyces*. Streptomycin is in FRAC code 25. Streptomycin is mainly used on apples and pears for the control of fire blight. Streptomycin is also used as an injectable antibiotic for humans and animals. According to a February 7, 2006 memorandum from EPA's Office of Prevention, Pesticides and Toxic Substances Division to Lance Wormell, Chemical Review Manager (page 10) "doses for drug treatment (Goodman and Gillman's The Pharmacological Basis of Therapeutics, 10$^{th}$ edition) are much higher than exposure expected from dietary or residential routes of exposure to the pesticidal uses. Drug treatment may continue in an individual for several weeks to several months. In contrast, potential human exposure to dietary residues from pesticidal uses are for much lower doses and are by the oral route, with very poor absorption." According to page 11 of this memorandum, "because anticipated dietary residues are so low, it is unlikely that antibiotic resistance from pesticidal use of streptomycin would result from food exposure." The proposed expansion of streptomycin use to combat bacterial canker in grapefruit and bacterial spot in tomatoes would add a very small amount of exposure and thus would not be expected to increase the chronic aggregate exposure to streptomycin.

Citrus canker caused by the bacterium *Xanthomonas citri* subsp. *citri* affects most types of citrus. Symptoms include raised lesions on mainly the lower leaf surface. As the disease develops, the lesions become corky to crater-like in appearance with raised margins and sunken centers. A yellow halo develops around the edge of the lesion. Lesions also develop on fruit and stems. This is mainly a cosmetic disease, but in highly infected crops, defoliation, shoot die-back and fruit drop results. Wind-

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driven rain easily disperses the bacterium throughout the field. Citrus canker is severe, especially in the state of Florida, where conditions make it difficult to control the disease (Dewdney and Graham, 2012). During 2004 and 2005, strong winds and rains from a number of hurricanes resulted in a widespread dispersion of citrus canker throughout the main citrus growing regions in Florida. In 2006, the citrus canker eradication program in Florida was terminated and citrus canker became endemic in Florida (Muraro, 2012). Currently, the only form of chemical control for this disease is applications of copper compounds (Group M1 Fungicides). It is now a concern that excessive use of copper compounds when used as bactericides may lead to the development of copper-resistant strains of *Xanthomonas citri* subsp. *citri* (Behlau, et al., 2011). A study done by Behlau et al in 2011 discovered that the proportion of epiphytic bacteria resistant to streptomycin on leaves was proportionally lower than the copper-resistant bacteria population. The study confirmed that "availability of an alternative bactericide, such as streptomycin, to integrate into a copper-based program would reduce the amount of each bactericide sprayed in citrus orchards and possibly lower the selection pressure for bacterial resistance to these chemicals" (Behlau et al., 2011). Although copper products are effective for preventing fruit infection, these compounds are much less effective for reducing leaf infection. Copper is also less effective in reducing disease spread. In addition, copper products should be used minimally due to the accumulation of the metal in the soil, phytotoxicity issues on the fruit peel, and environmental concerns (Dewdney and Graham, 2012). Therefore, the use of streptomycin on grapefruit for control of citrus canker would provide a new mode of action for control of citrus canker

Many growers and state extension personnel support the use of streptomycin for control of citrus canker. Expressing his support for a Section 18 emergency registration of FireWall®17 WP (streptomycin), James H. Graham, professor of Soil Microbiology at the University of Florida communicated many important reasons for the registration of this chemical. According to Graham, grapefruit is the Florida citrus industry's most important fresh citrus variety Grapefruit is also the most susceptible variety of citrus grown in Florida. During the 2005-06 crop year, grapefruit was valued at $174 million. By the 2009-10 crop year, the value of the Florida grapefruit crop had dropped to just $123 million; this represents a 30% decline in just four years due, largely, to the impact of citrus canker (Graham et al., 2010; Ritenour, 2009). In order to attain a high level of control of this disease, growers need an integrated program that utilizes all disease control methods available. Windbreaks are important for grapefruit protection from the spread of this bacterium. Since windbreaks have only recently been planted in Florida, the only current management tool available to limit the disease is bactericidal copper sprays. Many applications of copper sprays (10 to 14) are required to protect the fruit. One of the issues associated with many copper applications is phytotoxicity (Graham et al., 2008; Graham et al., 2010). Trials with streptomycin conducted with Dr. Rui Leite, Plant Pathologist at IAPAR, in the state of Parana, Brazil establish that streptomycin is efficacious for control of canker at rates comparable to intermediate to full rates of copper. Streptomcyin is also efficacious when used in combination with reduced rates of copper or alternated with copper In fact, alternating streptomycin applications with copper resulted in less phytotoxicity issues to the fruit. The limited use of streptomycin also minimizes the risk of *X. citri* subsp. *citri* developing resistance to streptomycin as well as other non-target effects of the antibiotic that might be of concern including residues on fruit. After conducting efficacy trials on several chemicals (SARs, antibiotics and other contact bactericides) for citrus canker control, it was concluded that none of the alternatives to copper other than streptomycin have demonstrated efficacy (Graham, 2007). In 2012, the U.S. EPA issued a specific exemption under the provisions of Section 18 of the Federal Insecticide, Fungicide and Rodenticide Act to the Florida Department of Agriculture and Consumer Service for the use of FireWall 17 WP to control citrus canker on up to 54,000 acres of Florida grapefruit. Independent

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economic analysis shows use of FireWall 17 WP to aid in the control of bacterial canker in grapefruit results in a net return to growers of $261 per acre (Graham, 2011).

Bacterial spot caused by *Xanthomonas* spp. is a serious disease of tomatoes grown in the field and the greenhouse. It is a destructive disease on seedlings and can result in total crop loss. Symptoms begin as small light to dark green lesions that appear water-soaked. Lesions later enlarge and appear black in color and greasy. Lesions can include a yellowish halo. Many leaf spots can develop, causing surrounding tissue to become necrotic. Fruit spots are first pale green raised areas that are surrounded by water-soaked borders. These spots then grow in size and become brownish, raised and scabby. Diseased fruit become unmarketable. Moist weather and splattering rain disseminate this pathogen. Currently, the major form of chemical control for this disease is applications of copper compounds (Group M1 Fungicides) (Sun et al., 2002). As mentioned above, it is now a concern that excessive use of copper compounds when used as bactericides has led to the development of copper-resistant strains of *Xanthomonas*. Copper resistant *Xanthomonas* is widespread in Florida due to the heavy reliance upon copper for disease control. Also, the use of copper compounds can lead to phytotoxicity concerns in tomato and environmental impacts including high accumulation of copper ions in the soil (Momol, et al., 2008). There are currently no other antibiotics registered for use on tomato other than streptomycin use on tomato transplants before entering the field. According to Momol et al., 2008, "the management of bacterial spot is a challenge in commercial production in Florida due to limited efficacy of fixed copper bactericides and the presence of copper-tolerant strains." Using an integrated management program against bacterial spot is key for successful tomato production. The registration of streptomycin use on tomato plants in the field and greenhouse can provide another option for tomato growers and allow the grower to alternate between different modes of action.

The attached table contains labeled fungicide options capable of controlling citrus canker of grapefruit and bacterial spot in tomato (field and greenhouse). Citrus and tomato growers currently have fungicides registered for the control of citrus canker in grapefruit and bacterial diseases in tomato. Streptomycin will offer a different mode of action compared with these and should qualify as a beneficial fungicide. Thank you very much for your consideration.

Sincerely,

Kathryn Homa
Research Analyst
IR-4 Project

Attachment

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| Crop | Pests | Proposed Use Pattern for Firewall 17 WP | Labeled Fungicides |
|---|---|---|---|
| Grapefruit | Citrus Canker | 0.34 lb ai/acre/application<br>21 day retreatment interval<br>0.68 lb ai/acre/season<br>100 GPA minimum<br>PHI= 60 days | Copper hydroxide + copper oxychloride (Group M1)<br>Copper hydroxide (Group M1)<br>Copper ammonium complex (Group M1)<br>Copper octanoate (Group M1)<br>Basic copper sulfate (Group M1)<br>Copper sulfate pentahydrate (Group M1)<br>Cuprous oxide (Group M1) |

| Crop | Pests | Proposed Use Pattern for Firewall 17 WP | Labeled Fungicides |
|---|---|---|---|
| Tomato (Field and Greenhouse) | Bacterial Spot | Apply at a concentration of 200 ppm as a spray to runoff.<br>7-14 day retreatment interval<br>4 applications per season<br>125 GPA maximum<br>PHI=1 day | Acibenzolar-s-methyl (Group 21)<br>Copper hydroxide + Copper oxychloride (Group M1)<br>Basic copper sulfate (Group M1)<br>Copper oxychloride sulfate (Group M1)<br>Copper hydroxide (Group M1)<br>Copper oxychloride (Group M1)<br>Copper ammonium complex (Group M1)<br>Copper octanoate (Group M1)<br>Mancozeb (Group M3)<br>Mancozeb + zoxamide (Group M3; Group 22)<br>Copper hydroxide + mancozeb (Group M1, Group M3)<br>Copper sulfate pentahydrate (Group M1)<br>Cuprous oxide (Group M1)<br>Cymoxanil + famoxadone (Group 27; Group 11)<br>Basic copper sulfate + sulfur (Group M1, Group M2) |

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